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1. *A revision of some South African Brachiopoda; with Descriptions of New Species.*— By J. Wilfred Jackson, D.Sc., F.S.A., F.G.S. (Late of Manchester Museum). (With Plates I-III.)

1. *Introduction*

More than twenty years ago I received through the courtesy of the Director of the South African Museum a small collection of South African Brachiopoda for report and description. Various unavoidable circumstances prevented me from giving the necessary time and attention to the collection, and, in consequence, the report on the same has been considerably delayed.*

The collection, though a small one, is of great interest as it contains several hitherto undescribed species and thus adds materially to our knowledge of the brachiopod fauna of the South African Province. The specimens came from several stations extending from the neighbourhood of Saldanha Bay on the west coast to Delagoa Bay on the east. Those from the Saldanha Bay area include a new species of *Megathiris* and one of *Crania*. Hitherto *Megathiris* has not been reported from Cape waters. From False Bay there is also a strongly-costate *Kraussina* which differs sufficiently from the well-known *Kraussina rubra* (Pallas) as to merit specific recognition. In addition there is a small species of *Gryphus* from the south coast, off Cape St. Blaize and Cape St. Francis, which appears to be undescribed. The remaining species comprise a new *Terebratulina* (formerly referred to *Terebratulina septentrionalis* Couth.), and *Terebratulina abyssicola* Adams and Reeve, previously recorded from the Cape. To these are to be added *Lingula* (two species) from Durban and Delagoa Bay, and *Agulhasia davidsoni* from two new stations, one being off Durban.

The description of the above series provides an opportunity of discussing and revising a number of other South African species preserved in the British Museum (Natural History) and in other collections. I have to thank the authorities of the above institution for the privilege of examining many of their

* Additional material was sent to the author in 1949, and his revised report was received in 1950. Post-war difficulties have further delayed the publication of this report. Ed.

specimens; also Messrs. H. McClelland and J. R. le Brockton Tomlin, M.A., for the loan of material. My own private collection has also been fully utilized.

The most important results achieved through the close study of this material is the placing of the *Kraussina*-series on a better basis, and the removal of certain forms erroneously ascribed to that genus. For many years this series has been in a state of confusion and a stumbling block to students of the Brachiopoda through the erroneous identifications that have been made.

Some particulars with regard to punctation are added in the hope that these may prove useful in future researches on this group.

2. *Previous Research*

The Brachiopod fauna of South Africa is not a very large one, but it includes some interesting species. Very little research has been conducted upon these in recent years, and nearly all the records date from the latter part of the eighteenth century or the first two-thirds of the nineteenth century.

The first notice of Brachiopoda in Cape waters appears to be that of Pallas, who, in 1766,[1]* described *Anomia rubra* (now *Kraussina rubra*). Chemnitz, in 1785,[2] described the same species as *Anomia striata promontorii bonae spei*, and another species, also from the Cape, as *Cognata Anomia craniolaris basi perforata.* Owing to Chemnitz not being a binomial writer, his species are not recognized. G. B. Sowerby, in 1847,[3] redescribed Chemnitz's second species as *Terebratula cognata*, which is now recognized as *Kraussina cognata* (Sow.)

In 1819, Lamarck[4] described a species from Mauritius as *Terebratula pisum.* This species has given rise to much confusion and has been misidentified on several occasions. It is mentioned here as being an undoubted member of the fauna of the Natal coast. The form attributed to this species by Davidson[5] is not that of Lamarck: it is referred to on a subsequent page.

G. B. Sowerby, in 1847,[3] described a *Terebratula algoensis* from Algoa Bay, coll. J. S. Bowerbank. The specimen, a bleached ventral valve, is in the British Museum. It has been referred to *Kraussina rubra* by Reeve, while Krauss regarded it as the same as his *Terebratula natalensis.* A discussion of this species is given later.

Dr. F. Krauss, in 1848,[6] gave three species for South African waters, viz. *Terebratula capensis* (Gmel.), *Terebratula cognata* (Chem.) Sow., and *Terebratula natalensis* Krauss (Natal). The *T. capensis* (Gmel.) is *Kraussina rubra* (Pallas); *T. cognata* (Chem.) Sow. is *Kraussina cognata* (Sow.); *T. natalensis* Krauss has been referred to *Kraussina* and considered to be the same species as *Terebratula pisum* Lamarck. The question as to its generic and specific position is discussed on a later page.

In 1850,[7] A. Adams and Lovell Reeve described as new two species of brachiopods as follows:— *Terebratula capensis*, dredged off the Cape of Good Hope at a depth of 120 fathoms; and *Terebratula abyssicola*, Cape of Good Hope,

* Superior numbers refer to the Bibliography at end.

120 fathoms. The *T. capensis* Ad. and Rve. is not that of Gmelin (=*Kraussina rubra*): it was changed by Davidson in 1852[8a] to *Kraussia deshayesii* (later *Kraussina*) and regarded by him as nearly related to *Terebratula pisum* Lam. Like the latter, it is not a *Kraussina*, but goes with *pisum* Lam. and *pisum* Dav. The *Terebratula abyssicola* Ad. and Rve. is now *Terebratulina abyssicola* (Ad. and Rve.).

In 1870,[9] the late Dr. Dall described a *Terebratella*, which he later, 1871,[10] called *Terebratella rubiginosa*, from Simons Bay, Cape of Good Hope. The single specimen is in the United States National Museum. Little can be said concerning this species until more examples are forthcoming. I have been unable to examine the original figure, but the description of the loop suggests that it is of a peculiar type.

A rather remarkable species was described and figured by W. King in 1871[11] under the name of *Agulhasia davidsoni*, the examples having been obtained on the Agulhas Bank, South Africa, from a depth of 45 to 60 fathoms. It is a very small species with a curious and long beak to the ventral valve. The genus is said to have Cretaceous representatives in Europe.

During the 'Challenger' Expedition three species of brachiopods were met with at the Cape. These were described by Davidson in 1880[5] as follows: *Terebratula vitrea* var. *minor* Philippi (p. 29, pl. II, figs. 5-6); *Terebratulina caput-serpentis* var. *septentrionalis* Couth. (p. 33, pl. I, figs. 6-9); and *Kraussina pisum* (Val, apud Lam.) (p. 54, pl. IV, figs. 7-8). All were dredged at Station 142, off the Cape of Good Hope, lat. 35°4′S., long. 18°37′E., December 1873. 150 fathoms. *Terebratula vitrea* var. *minor* is now known as *Gryphus affinis* (Calcara) and is common in the Mediterranean. The specimens dredged at the Cape are not that species. They are referred on a later page to a new form of *Gryphus*. *Terebratulina septentrionalis* is a distinct species and not a variety of *T. caput-serpentis* (now *retusa* L.). It occurs at many stations in the North Atlantic, off Northern Europe and off the eastern states of America. The Cape specimens are distinct from that form and are dealt with later in this memoir. The examples referred by Davidson to *Kraussina pisum* are specifically distinct from Lamarck's species. These two species are also generically distinct from *Kraussina*.

In 1892,[12] Fischer and Oehlert gave a list of nine species as inhabiting Cape waters and remarked on the great dissimilarity between this fauna and that of the Magellanic Province. They called attention to the recorded presence of two species of *Kraussina* in the Australian region, viz. *K. lamarckiana* and *K. atkinsoni*. These two species, however, do not belong to the genus *Kraussina*: the first is the genotype of *Megerlina* and the second may also belong to that genus.

In the Journal of Conchology for 1901[13] E. A. Smith recorded *Kraussina atkinsoni* (T. Woods)—a Tasmanian species—for Algoa Bay, Cape Colony (Brit. Mus. presented by J. H. Ponsonby). I have examined the specimens in question—four in number (B.M. 1900.6.13.5-8)—and find them to be undoubted juveniles of the *Terebratula pisum* Lam., which is not a true *Kraussina*.

In my opinion, the Tasmanian species also does not belong to the genus *Kraussina*, as it possesses a different type of cardinalia and brachidium.

In 1908,[14b] Blochmann recorded the discovery by the 'Valdivia' Expedition of a small species of *Liothyrina* (=*Gryphus*) in company with *Kraussina rubra* and *Terebratulina abyssicola* (not *septentrionalis*) on the Agulhas Bank. He figured the brachidium of the *Liothyrina* (pl. 39, fig. 31) and regarded it as distinct from *Liothyrina* (now *Gryphus*) *affinis*. It is possibly the same species as that referred to *Gryphus* sp. nov. in this memoir.

Dr. J. Allan Thomson, in 1918,[15] listed ten species as occurring at the Cape, and called attention to the fact that no additions had been made to the brachiopod fauna of South Africa during the previous thirty years. He remarked especially on the absence of *Crania*, and discussed the relation of the fauna with that of Australia and other places.

Dr. W. H. Dall, in 1920,[16] recorded *Pantellaria* (olim *Mühlfeldtia*) *echinata* (F. & O.) as from the Cape of Good Hope, 224 fathoms (Jeffreys coll.), one specimen in the United States National Museum. The type locality of this species is 'Off Cape Bojador, Sudan [*sic.*] coast of West Africa, 407 fathoms'. In a paper in 1921,[17] the present author referred to the presence in the British Museum (Natural History) of an immature example of *Mühlfeldtia truncata* labelled 'South Africa. J. H. Ponsonby coll., 1900. 6.13.4.' The occurrence at the Cape of this and the previously mentioned species—both Northern forms, one Mediterranean and east Atlantic, the other West African—is very remarkable, but one feels somewhat doubtful as to the provenance of the specimens.

In 1932, Lt.-Col. W. H. Turton[54] published an account of the marine shells of Port Alfred. These were largely dead and drifted specimens and included a few brachiopods, one of which resembled a *Crania*.

PLATE I

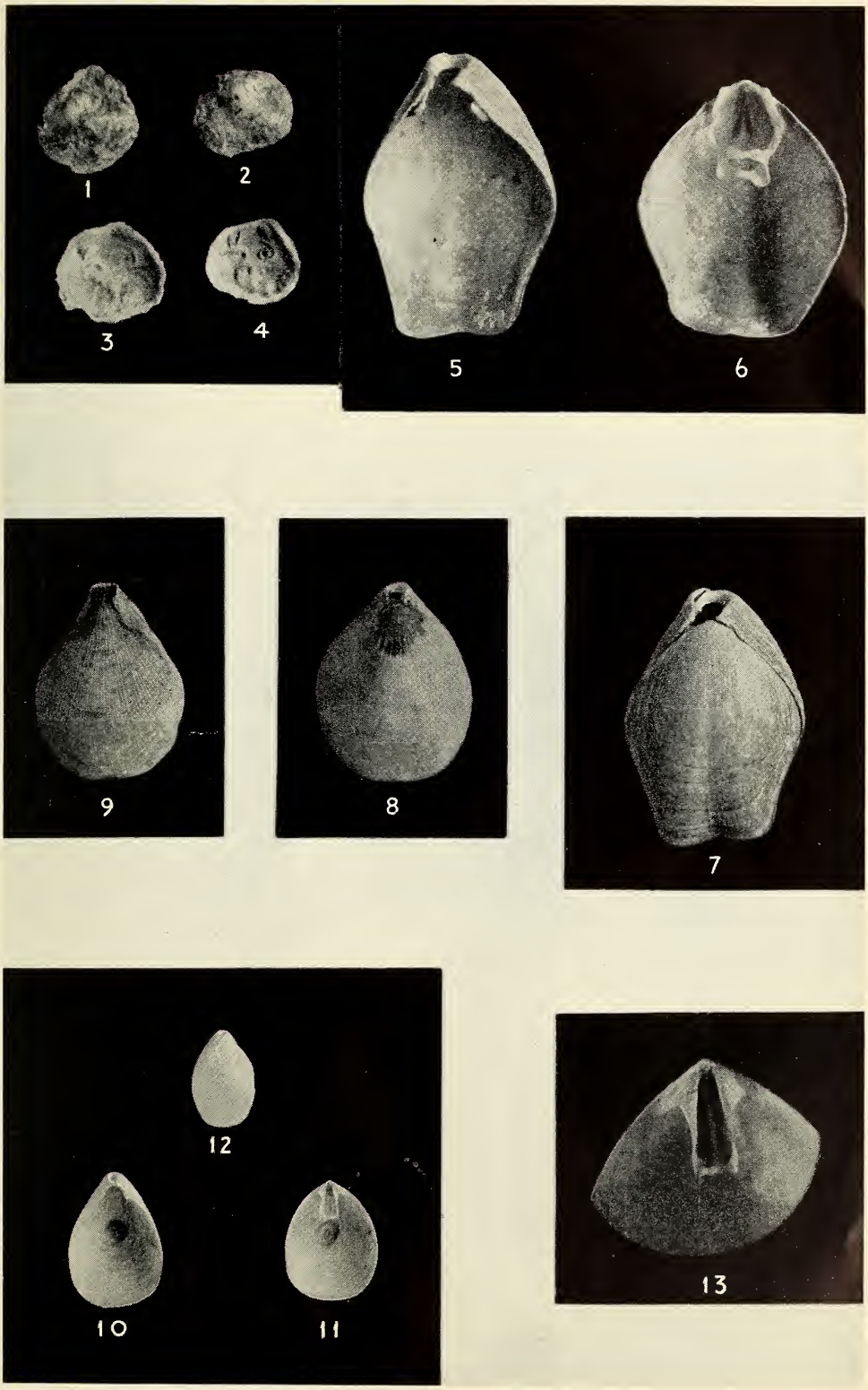
Figs. 1-4. *Crania roseoradiata* sp. nov. Syntypes, A. 5665. Dredged in 45 fathoms 7 miles SSW. of Constable Hill (Saldanha Bay). Four dorsal valves. South African Museum.

Figs. 5-7. *Terebratulina abyssicola* (Adams and Reeve). A. 5617. Dredged in 85 fathoms, 33°6′S., 28°11′E., off SE. coast of the Cape. South African Museum. Fig. 7, exterior view; figs. 5-6, interior views.

Fig. 8. *Terebratulina meridionalis* sp. nov. Holotype. Station 142, 'Challenger' Expedition (nearly 40 miles due south of Cape Point), 150 fathoms. British Museum (Nat. Hist.). No. 78.6.15.3.

Fig. 9. *Terebratulina septentrionalis* Couthouy. Casco Bay, Maine. British Museum (Nat. Hist.).

Figs. 10-13. *Gryphus capensis* sp. nov. Holotype, A. 5627. Dredged in 75 fathoms, 29 miles SW. of Cape St. Francis. Paratype, A. 5626. Dredged in 125 fathoms, 73 miles S. by W. of Cape St. Blaize. South African Museum. Figs. 10-11: Holotype. Fig. 12: Paratype. Fig. 13: interior of Holotype.



South African Brachiopoda.

3. *Description of Species*

ORDER ATREMATA BEECHER, 1891
Superfamily LINGULACEA Waagen, 1885.
Family LINGULIDAE Gray, 1840.

Genus *Lingula* Bruguière.

1797. *Ency. Meths. Vers.* I, p. 151, II, pl. 250.

Lingula sp. aff. *murphiana* (King MS.) Reeve.

Lingula murphiana (King MS.) L. Reeve, 'Mon. of Lingula', *Conch. Icon.*, November 1859, pl. I, fig. 3. Davidson, 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. III, 1888, p. 215, pl. XXIX, fig. 11, and pl. XXX, figs. 1-3.

In 1920, when studying the brachiopods in the British Museum (Natural History), I noted a spirit specimen in the zoological department labelled: '*Lingula anatina* Lam. Durban. J. H. Ponsonby. 99.4.14.1.'

Many years ago, Mr. R. Cairns presented me with a large example of *Lingula* with a label: 'Durban, 1900. J. P. Cregoe.' On making inquiries about this collector, Dr. K. H. Barnard tells me that Cregoe contributed quite a lot to the Invertebrate collection of the South African Museum about that period, chiefly from Natal and Lourenço Marques; but the Museum files contain no biographical details.

The *Lingula* in question agrees closely in shape and size (viz. L. 58·5: W. 26·1 mm.) with the *L. murphiana* figured by Reeve (op. cit., pl. 1, fig. 3) and has the same coppery-red colour with green border anteriorly. It also agrees with two other large examples in my collection from New South Wales (precise locality unknown).

Reeve's description of his species is as follows: 'Murphy's Lingula. Shell oblong-ovate, anteriorly square, posteriorly attenuated, umboes small, sharp, yellowish-green, stained with coppery-red; valve closed throughout.
King MS. Mus. Cuming.
Hab. Moreton Bay, Australia; Strange.'

The specimen figured is, L. 57·8: W. 25·7 mm.

He further remarks: 'Whether this should be regarded as an Australian form of *L. anatina* or as a distinct species, it is certain that the differences are obvious and constant. The late Captain Phillip King, who was an excellent conchologist . . . was struck by the peculiarities of this *Lingula*, and sent specimens home to Mr. Cuming with the above name. More have been collected by Mr. Strange in nearly the same locality, and all are distinguished from *L. anatina* collected abundantly by Mr. Cuming in the Bay of Manila, by a more square outline, and by a peculiar coppery-red tone of colour.'

Davidson (op cit.) figures two large examples from Moreton Bay in his collection at the British Museum, and gives an amplified description and the colour as coppery-red, with bands of different shades of green and brown. He

gives the size as: L. 2 in. 6 lines: W. 1 in. 1 line (=L. 63·5; W. 27·7 mm.). The size of the specimen in his plate XXX, figs. 1-3, is somewhat less, being: L. 53·5: W. 24 mm.

Lingula murphiana, though first described from Queensland, appears to have a wide distribution. According to W. H. Dall's List of 1920,[16] the United States National Museum possesses the following: N.E. Australia, coll. Stearns, 2 specimens; Australia, coll. Cuming, 2 specimens; Fiji Islands, U.S. Ex. Exp., 2 specimens; Vita Leva, near Rawa River, U.S. Ex. Exp., 2 specimens; and off Shimbaya Gulf, Japan, E. S. Morse, 1 specimen.

One wonders how much reliance has been placed on colour in these determinations. It seems to be a variable character in some forms.

I have in my possession four very large specimens of the same shape and colouring as the Queensland form collected at Karachi by Lt.-Col. H. C. Winckworth in September 1932 and given to me by his brother Mr. R. Winckworth. The sizes of these are: 64 × 28·1; 62·4 × 29; 60·8 × 29; and 59·3 × 27·7 mm. If these had been found at the Queensland locality, they would have been referred to *L. murphiana* Rve.

From the same collector I have a smaller *Lingula* found at Trincomali, Ceylon, October 1929, also rather dark in colour with a green border. It measures: L. 43·3; W. 18·8 mm. It might very well be a younger stage of the above examples.

Dall[16] cites *Lingula translucida* Dall—a ruddy-brown species—from Karachi, coll. Captain Shopland, 2 specimens and Fulton, 2 specimens, but does not figure the species. He also cites the same form from Java, coll. Ward, 2 specimens and Palmer, 1 specimen, and from Tataan Island, Philippines, 12 fms., coll. Bureau of Fisheries, 1 specimen. It is uncertain which is the type station. Dall gives Java, but cites the catalogue number for Karachi.

With regard to the *Lingula anatina* of authors, this Eastern Seas species (Type station, Amboyna, Moluccas) was referred to the *Patella unguis* of Linnè by Dall in 1920,[16] but the shell to which Linnè refers in Rumphius' *D'Amboinische Rariteitkamer*, 1741, t. 40, fig. L, is a *Parmophorus* or *Scutus* and not a brachiopod. Solander, in his *Portland Catalogue*, 1786, No. 1718, p. 77, mentions *Mytilus lingua* or green Duck's-bill Limpet, S., *Humphrey's Conchology*, pl. 2, fig. 2, from Amboyna. This last work was published in 1770 and the figured shell is certainly a *Lingula*. Though the name *anatina* has been in use for a long time, the species should be known as *Lingula lingua* (Sol.).

Lingula sp. aff. *exusta* Reeve

Lingula exusta Reeve, 'Mon. of Lingula', *Conch. Icon.*, November 1859, pl. II, fig. 9. Davidson, 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. III, 1888, p. 217, pl. XXVIII, figs. 20-21*a*.

Dr. K. H. Barnard has recently submitted to me two specimens of a *Lingula* which he collected in 1912 at Delagoa Bay, Indian Ocean, S.E. Africa. The specimens are rather small and measure: 20 × 8 and 17·2 × 6·4 mm. Both

are light brown in colour and resemble the *Lingula exusta* of Reeve, though about half the size of the type.

Reeve describes the species from a specimen in the Mus. Cuming as follows:

'The Swarthy Lingula. Shell oblong-ovate, rather thin, reddish-yellow, deeply stained with brown towards the margin, shining, umboes rather sharply beaked.

Hab. Moreton Bay, Australia; Strange.'

He further states: 'If *L. murphiana* be an Australian form of *L. anatina*, this might be regarded as the representative in the same locality of *L. hians*. Both species exhibit a peculiar coppery-redness, heightened in this to a dark, shining, swarthy tone of colour.'

Davidson (op. cit.) gives a fuller description mentioning its shining, darkish, coppery yellow-brown colour. He reproduces Reeve's figure in fig. 20; fig. 21 being from a specimen from the same locality in his collection at the British Museum. He gives the length as 1 in. 7 lines and breadth 8 lines (= 40·6 × 17·1 mm.).

Dall, in his 1920 List ([16]p. 265) gives Brammo Bay, Dunk Id., N. Queensland, coll. E. J. Banfield, 1 specimen, in the United States National Museum. This is much farther north than the original locality.

I possess some half-dozen specimens of a *Lingula* from Singapore with similar colouring and shape to the Delagoa Bay examples, one or two being only slightly larger.

There is need for further research in connection with the various forms of *Lingula*, as there appears to be much confusion with regard to species.

The form known as *L. anatina* (now referred to *lingua*), though normally of a light green colour (as in Reeve, 1841, pl. II, fig. 10), is at times suffused with a bronzy colour, especially near the margins, or may be of a dark brown colour all over the surface, as in specimens in my collection from Amboyna, Moluccas ('Siboga'), and Zamboanga, Philippines (coll. F. G. Pearcey, 1875).

Order NEOTREMATA Beecher, 1891.

Superfamily CRANIACEA Waagen, 1885.

Family CRANIIDAE King, 1846.

Genus *Crania* Retzius.

1781. *Schrift. Berlin Ges. nat. Fr.* 2 (4), p. 72.

Crania roseoradiata sp. nov.

(Pl. I, figs. 1-4.)

Description: Shell (upper, or dorsal, valve) small, depressed, somewhat ovate in outline, with a short, almost straight posterior margin, apex low, subcentral, directed posteriorly; surface eroded, strongly wrinkled by growth-lines, and radiated by rose-coloured streaks or flames on a whitish background. Interior very finely granulose, margin thin and narrow beyond the heavy submarginal encircling ridge. Muscular impressions of posterior adductors well-marked,

oval, obliquely disposed on low tubercles within the posterior angles of the shell; imprints of protractors in small pits on external side and near the anterior extremities of posterior adductors impressions; imprint of median odd muscle very slight and situated on floor of valve between the posterior adductors; imprints of anterior adductors very distinct in ovate pits with strong posterior ridges, closer together than posterior pair and situated just behind the centre of the valve; small pits for insertion of retractors of arms immediately adjacent and external to the last; imprints of protractors of arms very slight on floor of valve in front of anterior adductors. Anterior to the muscle impressions are two shallow, ovate, cavities (one on either of the median line) showing indistinctly the grooves of the pallial sinuses.

Dimensions: Syntypes, Length, 9 mm., breadth, 10 mm.
,, 7·7 mm., ,, 9 mm.

Catalogue No. A5665, in the South African Museum.

Type-locality: 7 miles SSW. of Constable Hill, Saldanha Bay, dredged in 45 fms., with *Megathiris* sp. nov.

Remarks: This is the first authentic *Crania* to be reported from South Africa. In 1931, Lt.-Col. W. H. Turton submitted for my opinion a very imperfect dead valve, 12 × 11 mm., from Port Alfred which I tentatively referred to *Crania*. In 1932, Turton figured the specimen as *Crania* sp. ([54]pl. LXX, fig. 1843). Port Alfred lies nearly 500 miles to the east of Saldanha Bay. The nearest record of the genus appears to be a species from West Africa assigned by Reeve[18] to *Crania rostrata* Hoeninghaus. Four examples of this form are in the Cuming Collection at the British Museum (Natural History). Two are attached to fragments of dark-grey limestone and are the originals of the two lower figures of Reeve ([18]pl. I, fig. 3). Davidson[19] places *Crania rostrata* among the synonyms of *C. turbinata* (Poli), but says 'the so-termed *C. rostrata* figured by Reeve in his *Conch. Icon.* does not agree with Hoeninghaus's figures of his species'. He misquotes Reeve by giving 'South Africa' instead of 'West Africa' (*vide* Cuming) as the habitat. One of the British Museum specimens shows interior details and the ventral valve agrees closely with the figure of the interior given by Hoeninghaus.[20] The position and number of the pallial sinuses are the same and there is the same arrangement

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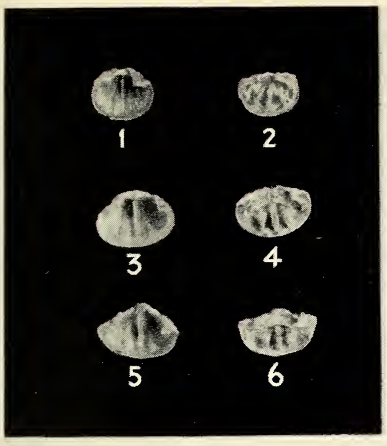
PLATE II

Figs. 1, 2, 7, 8, 14, 15. *Megathiris detruncata* (Gmelin). Messina, Mediterranean (J. W. J. coll.). Figs. 1-2: interior views of ventral and dorsal valves. Figs. 7-8: exterior views of same. Fig. 14: interior view of dorsal valve (fig. 2). Fig. 15: interior view of ventral valve (fig. 1).

Figs. 3-6, 9-13, 16, 17. *Megathiris capensis* sp. nov. Holotype, A. 5616a. Paratype, A. 5616b. Dredged in 45 fathoms, 7 miles SSW. of Constable Hill (Saldanha Bay). South African Museum. Figs 3, 4: interior views of ventral and dorsal valves of Holotype. Figs. 5, 6: interior views of ventral and dorsal valves of Paratype. Figs. 9, 10: exterior views of ventral and dorsal valves of Holotype. Figs. 11, 12: exterior views of ventral and dorsal valves of Paratype. Fig. 13: exterior view of dorsal valve of Holotype. Fig. 16: interior view of dorsal valve of Holotype. Fig. 17: lophophore in spirit specimen.



South African Brachiopoda.

with regard to the muscular impressions and prominent rostrellum. The dorsal valve was not figured by Hoeninghaus so no comparison can be made here. Until a much-desired revision is made of the various forms attributed to either *Crania anomala* (Müll.) or *Crania turbinata* (Poli) little advance in knowledge can be attained. Hoeninghaus's type of *Crania rostrata* appears to have come from the Mediterranean.

The absence of the ventral valve in the new Cape species renders it impossible for a complete comparison to be made with the West African *C.* '*rostrata*'; but a comparison of the dorsal valve shows that the two forms are sufficiently distinct to merit a new name being given to the Cape species.

It is of some interest to compare *C. roseoradiata* with the *C. suessi* Reeve.[18] The latter species was founded on five specimens in the Cuming Collection reported to have been collected by Mr. Strange at Sydney. It is described as being faintly tinged with orange-red. The five specimens are in the British Museum and are now rather bleached: they possess somewhat yellowish rays. They bear a label in German? handwriting (?Pfeiffer's) 'Sidney, M. Strange' (note misspelling). In general form they somewhat resemble the West African examples described and figured by Reeve as *C. rostrata* Hoen., and the coloured rays of the upper valve suggest a relationship with the *C. roseoradiata* of this memoir. *Crania suessi* Reeve has also been recorded from Mast Head Reef, Queensland, 17–20 fathoms.[21] This record is based upon a few worn valves and there is some hesitation as to species.

The occurrence of *Crania* at the Cape is an interesting addition to the South African fauna, but until a further study has been made it is difficult to ascertain whether it is of northern or southern facies.

Order TELOTREMATA Beecher, 1891.
Superfamily TEREBRATULACEA Waagen, 1883.
Family TEREBRATULIDAE Gray, 1840.
Subfamily CANCELLOTHYRINAE Thomson, 1926.
Genus *Agulhasia* King.

1871. *Ann. Mag. Nat. Hist.* (4), vii, p. 109.

Agulhasia davidsoni King

Agulhasia davidsoni King, loc. cit., 1871, p. 111, pl. XI, figs. 1-7.

Terebratulina (*Agulhasia*) *davidsoni* King. Davidson, 'Monograph of Recent Brachiopoda', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. I, 1886, pp. 36-7, pl. 7, figs. 1-5.

Agulhasia davidsoni King. Thomson, *Brachiopod Morphology and Genera* (*Recent and Tertiary*), 1927, pp. 182-3, fig. 52 (after Davidson).

Remarks: The original specimens of this interesting species were obtained from 45 to 60 fathoms, on the Agulhas Bank, South Africa, and were described by Professor W. King in 1871 (op. cit., *supra*). I have been unable to examine the original examples, but the excellent description by Davidson ([19]pp. 36-7)

shows that the species is a remarkable one and sufficiently distinct from the young of some species of *Terebratulina*, as was at one time thought.

This extremely small species is characterized by the beak being produced into a tubular rostrum and by the possession of a long pedicle-collar (see Davidson,[19] pl. 7, figs. 1a and 2).

Through the kindness of Dr. K. H. Barnard I have been able to examine three specimens of this species dredged by the Cape Government trawler s.s. *Pieter Faure* from two new stations, one off the south-eastern Province, and the other off Natal.

The details are as follows:

Lat. 34°S., long. 25°44'E. dredged (no depth given). 2 specimens. A. 5633. South African Museum. Size: L. 4·2, W. 2·5 and L. 4·0, W. 2·3 mm. Cape Natal (i.e. Durban), W. × N. 6 miles, 54 fathoms, 1 specimen. A. 5634. South African Museum. Size: L. 4·2, W. 2·7 mm.

These specimens are smaller than the size given by Davidson, viz. 3 lines × 2 lines (= 6·3 × 4·6 mm.).

The specimens are interesting, not only in providing evidence of an extended eastern range of the species, but also on account of the opportunity they offer of studying the peculiar foraminal characters. As pointed out by Thomson ([28]p. 74 and footnote), 'the long beak is apicate, with a very long delthyrium which is partly filled by lateral trigonal deltidial plates, leaving an elongate pedicle-opening. The pedicle-collar extends nearly to the cardinal margin, and has the effect of restricting the pedicle mainly to an opening on the cardinal margin.' Davidson's figures ([19]pl. 7, figs. 1a and 2, repeated by Thomson, fig. 52) show this quite clearly.

King (op. cit.) confused the deltidial plates with the area, and the pedicle-collar with the deltidium.

Beecher ([29]p. 390) referred to the deltidial plates as being obsolete; this being probably due to the imperfect descriptions by King and Davidson.

Unfortunately details are lacking concerning the character of the animal, though the cardinalia and brachidium have been figured.

The range of *Agulhasia* has been given as Cretaceous to Recent, but no Cretaceous forms have been cited. *Terebrirostra* or *Lyra* from the Cretaceous possesses a somewhat similar tubular beak, but with the foramen at the apex: it belongs to an entirely different Family.

Genus *Terebratulina* d'Orbigny.

1847. *C.R. Ac. Sc. Paris*, XXV, p. 268.

Terebratulina abyssicola (Adams and Reeve)

(Pl. I, figs. 5-7)

Terebratula abyssicola Adams and Reeve, *Voy. Samarang*, Moll., 1850, p. 72, pl. 21, fig. 5: Reeve, 'Terebratula', *Conch. Icon.*, 1860, pl. 4, fig. 14.

Terebratula radiata Reeve, 'Terebratula', *Conch. Icon.*, 1860, pl. 3, figs. 7a-b.

Terebratulina abyssicola, Davidson, 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. I, 1886, pp. 37-8, pl. 5, fig. 54.

Terebratulina radiata, ibid., 1886, pp. 34-5, pl. 6, figs. 9-14.

Terebratulina africana Turton, *The Marine Shells of Port Alfred, South Africa*, 1932, p. 260, pl. LXX, fig. 1842.

Non *Terebratulina radiata* Baily, *Quart. Journ. Geol. Soc.*, vol. XIV, 1858, p. 136, pl. VIII, figs. 3a-d (= Jurassic species from Crimea).

Non *Terebratulina radiata* Moore, *The Geologist*, vol. III, 1860, p. 444, pl. XIII, figs. 11-14 (= Great Oolite species from Hampton Cliff, England).

Habitat: South-east coast of South Africa, lat. 33°6′S., long. 28°11′E., 85 fathoms (= opposite East London), 3 large examples A. 5617, South African Museum: also 4 miles off Cape Morgan, 17 fathoms, 8 small examples, A. 5618, South African Museum.

Remarks: There has been much confusion in the past with regard to this species, its type locality, and its relation to the *T. radiata* Reeve. The latter is merely the adult form of *T. abyssicola* Ad. and Rve., which antedates *T. radiata* by ten years. The type-locality is 'Cape of Good Hope (dredged at the depth of 120 fathoms); Belcher', as given by Reeve. The reference to Corea in Reeve's 'Corrigenda' is evidently a mistake. In the Zoological Department (Cuming Collection) of the British Museum are four specimens (three juveniles and one large example attached to some extraneous object) of *T. abyssicola*, with a legend on the bottom of the box 'Hab. Cape of Good Hope, 120 fms. M.C. ?Type'. The attached specimen looks like that figured in the 'Samarang' Report (pl. 21, fig. 5) and in *Conch. Icon.* (pl. 4, fig. 14), but is smaller and more globular. It shows the beginning of a sulcus in the dorsal valve, and the striae are like those on the umbonal part of a South African Museum specimen (A. 5617). The British Museum also possesses specimens of *T. abyssicola* from Port Alfred, Cape Colony (Coll. Lt.-Col. Turton, 1903, 12.19. 463-5). Davidson's figure of *T. abyssicola* (pl. 5, fig. 54) is a poor copy of that of Adams and Reeve.

As far as one can judge from a casual microscopic examination, the punctae of the 'Type-specimen' of *T. abyssicola* are the same as in Reeve's type of *T. radiata*, being small and slit-like and of the same density. The type-specimen of *T. radiata* is preserved with two other examples in the Zoological Department at the British Museum (Cuming Coll.), while the originals of Davidson's figures of the same species are in the Geological Department (Davidson Coll.) of the same Institution. The original of Davidson's *T. radiata* (pl. 6, fig. 11) has small, ovate punctae (slit-like) with the same density as Reeve's type.

The exact density of the punctae of the British Museum specimens has not been counted, but examples of *T. abyssicola* from other sources have been examined. Five somewhat dwarfed specimens from East London yielded the following results: in one the density was 352–368 per sq. mm., with dimensions of 30–40 × 15 μ; in three others the density ranged from 448 to 512 per

sq. mm., the dimensions being 20–30 × 15 μ; while the fifth example was very densely punctate with 576 pores per sq. mm., with dimensions of 15–20 × 15 μ. Four others from East London yielded 384 per sq. mm., and two from Port Elizabeth, 384–432 per sq. mm.

The three large examples, A. 5617 (pl. I, figs. 5-7), in the South African Museum are larger than any figured by Davidson (pl. 6, figs. 9-14), their dimensions being:

	Length	*Breadth*	*Thickness*
No. 1	24·0	19·2	15·0 mm.
No. 2	27·5	19·3	16·5 ,,
No. 3	28·4	29·0	16·8 ,,

The type of folding is sulciplicate (as Davidson, pl. 6, fig. 10), and all are rayed with black flames or streaks. The beaks are mesothyrid and the deltidial plates disjunct.

The number of pores per sq. mm. in these three examples ranges from 308–400, the dimensions being 30–40 × 15 μ, on the outer side, and 10 × 10 μ on the inner.

The eight small examples, A. 5618, in the South African Museum range in length from 4·5 to 13·4 mm., the beaks are submesothyrid to mesothyrid and the deltidial plates disjunct. They possess a uniplicate type of folding, the larger ones showing the beginning of the sulciplicate stage. Some are marked with black streaks, and all agree closely with shallow water forms in my collection from East London and Port Elizabeth. Some of these appear to be stunted or dwarf examples and show irregularities of growth: the shell also is much thickened.

This species under the name of *T. radiata* was cited as a new brachiopod for Western Australia by W. B. Alexander, in 1914.[26] The solitary specimen obtained had united deltidial plates, and this fact, together with its habitat, seems to suggest the *Terebratulina* (olim *Terebratula*) *cancellata* (Koch), since transferred to a new genus *Cancellothyris* by J. A. Thomson,[27] who also changed

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PLATE III

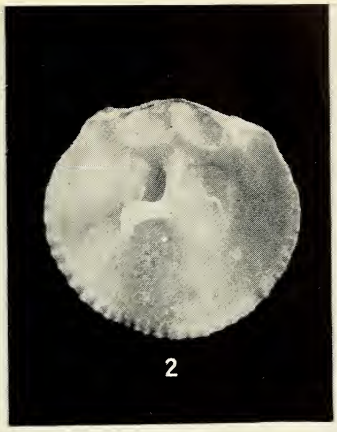
Figs. 1, 2. *Kraussina rubra* (Pallas). Agulhas Bank, South Africa, 22 fathoms (J. W. J. coll.). Fig. 1: exterior view. Fig. 2: interior view of dorsal valve.

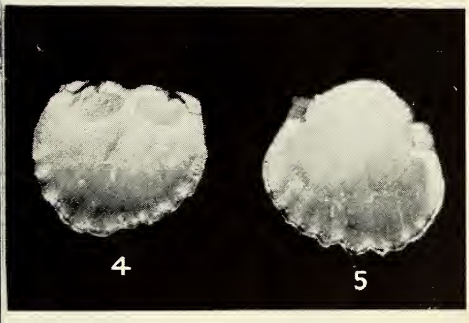
Figs. 3-5. *Kraussina crassicostata* sp. nov. Holotype, A. 5615. Dredged in 23 fathoms, False Bay, Cape. South African Museum. Fig. 3: exterior view. Figs. 4, 5: interior views of dorsal and ventral valves.

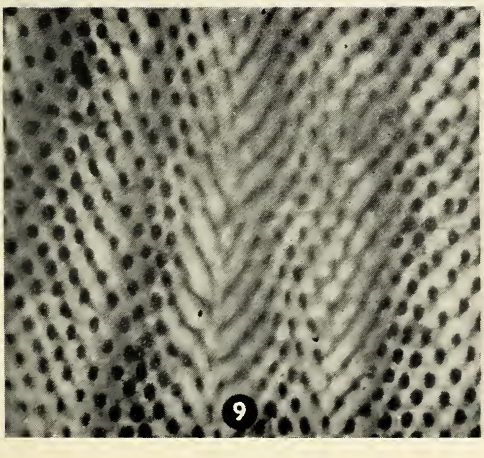
Figs. 6 and 9. *Megerlina striata* sp. nov. Holotype, Station 142, 'Challenger' Expedition (nearly 40 miles due south of Cape Point), 150 fathoms. British Museum (Nat. Hist.). No. 78.6.15.27. Fig. 6: exterior view. Fig. 9: punctation.

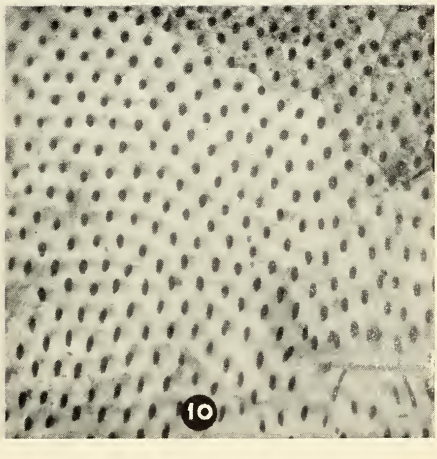
Figs. 7 and 10. *Megerlina pisum* (Lam.). South Africa, J. H. Ponsonby coll. British Museum (Nat. Hist.). No. 99.4.14.3765. Fig. 7: exterior view. Fig 10: punctation in specimen in J. W. J. coll. (ex. Agnes Crane, from Cape, 150 fathoms).

Fig. 8. *Megerlina capensis* (Adams and Reeve). Cape. Lombe Taylor coll. British Museum (Nat. Hist.). No. 74.12.11.386.









South African Brachiopoda.

the specific name to *australis* on account of *cancellata* being preoccupied by *Terebratula cancellata* Eichwald, 1829. But, unless the *T. cancellata* Eichwald turns out to belong to *Cancellothyris* also, there appears to be no reason for the change of the specific name.

Turton, in 1932 (pl. LXX, fig. 1842), figured as *Terebratulina africana* sp. nov. a small example from Port Alfred, near which place *T. abyssicola* is common. His figure shows a shell without apparent folding, the ventral valve having a submesothyrid foramen, disjoint deltidial plates and a pedicle-collar: the dorsal valve has rather long crura and an almost completed loop. The shell is thin and white with radiating striae and fine growth-lines, giving it a cancellated appearance, and does not seem to show evanescence of the striae, as in the next species. The absence of information regarding punctation renders it difficult to decide whether Turton's shell is to be referred to *T. abyssicola*, which occurs in the near neighbourhood. Turton's *T. radiata* ([54]p. 260) is a synonym of the last species.

Terebratulina meridionalis sp. nov.
(Pl. I, fig. 8)

Terebratulina caput-serpentis var. *septentrionalis* Davidson (non Couthouy), *Voy. Challenger*, Zool. vol. I, 1880, pp. 33-6, pl. I, figs. 6-9.

Terebratulina septentrionalis Davidson (pars), 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. I, 1886, pp. 28-32.

Description: Shell of medium size, ovate, with curved sides and slightly truncated front, widest at the middle. Valves regularly convex, ventral slightly deeper than the dorsal and possessing a slight, narrow, distinct sulcus anteriorly. Folding uniplicate. Surface of valves finely capillate, striae strong and simple in umbonal region, increasing by bifurcation, and becoming evanescent later; finely punctate. Beak short, suberect, foramen large, almost circular, submesothyrid, attrite; deltidial plates disjunct; pedicle-collar short. Hinge teeth without dental plates or swollen bases. Cardinalia in dorsal valve as is usual in *Terebratulina*, with socket-ridges fused to the crural bases and forming prominent ridges which project a little behind the dorsal umbo; small transverse cardinal process; no median hinge-plates. Crura long, descending branches of loop short, transverse band arched ventrally, crural processes united and transforming the loop into a ring. Muscular impressions feeble.

Dimensions: Holotype, length 22 mm., breadth 18 mm., thickness 9·5 mm.

Holotype and Locality: Specimen in the British Museum (Nat. Hist.), dredged by the 'Challenger' Expedition at Station 142, Cape of Good Hope (= nearly 40 miles due south of Cape Point) in 150 fathoms.

Remarks: In his 'Challenger' Report, Davidson (p. 33, pl. I, figs. 6-9) recorded the *Terebratulina septentrionalis* Couthouy (as a variety of *T. caput-serpentis* = *retusa*) as abundant at Station 142, lat. 35°4′S., long. 18°37′E., off the Cape of Good Hope, in 150 fathoms, together with '*Terebratula vitrea* var.

minor' and '*Kraussina pisum*'. In the same work he recorded the species from lat. 46°40'S., long. 37°50'E. (= Marion Island) in 150 fathoms, associated with '*Platydia anomioides*' and '*Waldheimia kerguelensis*'.

In his later work (p. 28), Davidson appears to cast some doubt upon the authenticity of the Cape locality, but at the same time gives the Marion Island latitude and longitude in error for the Cape.

By the courtesy of the British Museum authorities I have been able to examine the 'Challenger' examples and to compare them with typical *T. septentrionalis* Couthouy from Casco Bay, Maine, and other places. Some of these are preserved in the Zoological Department of that Institution, and I was surprised to find that one box, registered 78.6.15.28, contained two distinct species, one with evanescent striae and the other (a large, solitary example) agreeing with the true *T. septentrionalis* from Halifax, 83 fathoms ('Challenger' specimens, 78.6.15.24). I came to the conclusion that the true *T. septentrionalis* had probably been used for comparison and accidentally left in the same box with the others.

At the same Institution I also had the privilege of examining some specimens preserved in spirit and coming from Station 142. These I found agreed exactly with the examples mentioned above which showed evanescent striae; and like them differed sufficiently from *T. septentrionalis* to merit the erection of the present new species.

Compared with a spirit specimen of *T. septentrionalis* from Casco Bay, Maine, of almost the same size, viz. length 22 mm., breadth 17 mm., thickness 11 mm. (pl. I, fig. 9), the new species shows important differences in striation as well as in punctation. The striation of *T. meridionalis* is evanescent (pl. I, fig. 8) and contrasts strongly with that of *T. septentrionalis* (pl. I, fig. 9). The number of striae is about the same in both species. On the outer surface of the ventral valve, about the middle, *T. meridionalis* has small ovate pores, 20–30 × 15 μ in diameter, and 256–288 per sq. mm. In *T. septentrionalis* from Casco Bay, the pores are small and rounded, 15–20 × 15–20 μ, and 320–384 per sq. mm. at the middle of the ventral valve. Anteriorly both species are very similar in the possession of a slightly truncated front and low dorsal uniplication. The foramen in each species is also submesothyrid and there are rudimentary deltidia.

In addition to the British Museum material I have had the advantage of comparing others in my own collection as well as examples in the South African Museum. These are all from essentially the same neighbourhood as the 'Challenger' specimens and confirm the conclusion reached above. Specimens from 'Off Cape Point, S. Africa, 190 fathoms' (in my own collection, ex South African Museum) agree exactly with the 'Challenger' example from Station 142 (p. I, fig. 8). They are smaller in size, but low uniplication is visible. They have small, ovate pores 256–320 per sq. mm., and 20–30 × 15 μ in size.

Three small specimens in the South African Museum, A. 5623, dredged in 85 fathoms, off Cape Point, 10 miles S. 16° W., belong to the same species, and

a very young example in the same Museum, A. 5632, dredged at the same depth and place as the above, is probably the same.

The *T.* '*septentrionalis*' and the two other species of brachiopods recorded by Davidson from Marion Island require further investigation in the light of present knowledge.

With regard to '*Waldheimia kerguelensis*', the figures given by Davidson ([5]pl. III, figs. 3-5) suggest a somewhat different species from that under the same name from Kerguelen Island ([5]pl. III, fig. 1).

Terebratulina sp. indet.

Included in the South African Museum material are several juvenile examples of a *Terebratulina* which must remain unidentified pending further material. The specimens are all from the western side of the Cape—the opposite side from which *T. abyssicola* was dredged. Three lots are from the neighbourhood of Table Bay, and two lots are from off Saldanha Bay. Some notes on these may be useful in connection with further dredgings in these waters.

A. 5620. Table Bay, 22 fathoms (South African Museum).

There are three juvenile examples from this locality which possess a rather coarser and more distinct ornament than *T. meridionalis*. Near the umbo there are 13 or more strong, rounded striae which soon break up into fascicules of finer striae by bifurcation and trifurcation. There are also a few interpolated fine striae. All extend to the anterior margin with occasionally a second bifurcation at a late stage. The beak is short, suberect; foramen large and almost circular, submesothyrid, attrite. The deltidia in two examples are just touching at the points, but in the largest example they are disjunct (perhaps broken or worn by the umbo of the dorsal valve). In the smallest example the folding is uniplicate and in the two others slightly sulciplicate. The species presents some resemblance to *T. abyssicola*, but differs in punctation. It has long oval pores on the outer surface ranging from 224 to 288 per sq. mm., the dimensions being 30 (–45) × 15–20 μ. On the inside of the valve they are round and measure 15 × 15 μ.

A. 5621. 28 miles S. 76° W. of Lion's Head, Cape Peninsula, 140 fathoms. Four juvenile examples (South African Museum).

The punctation in these ranges from 272 to 288 per sq. mm., the diameters being 20 × 15–20 μ, on the outer side.

A. 5619. 34 miles S. 63° W. of Lion's Head, Cape Peninsula, 154 fathoms. Four juvenile examples (South African Museum).

The punctation ranges from 272 to 304 per sq. mm., with diameters of 15–20 × 10–15 μ, on outer side.

These two lots seem to agree with A. 5620, but are too young for critical comparison. The punctae are near those of *T. meridionalis* and less than in *T. abyssicola*.

A. 5628. Off Saldanha Bay, 20 fathoms. Five juvenile examples (South African Museum).

The punctation ranges from 320 to 352 per sq. mm., with diameters of ?30 × 20 μ (outer) and 10 × 10 μ (inner). One specimen has spicules in the genital sinuses of the ventral valve near those of *T. valdiviae* Bl.

A. 5622. 5 miles W. by S. of Constable Head (Saldanha Bay), 47 fathoms. One juvenile example (South African Museum).

The punctation ranges from 308 to 320 per sq. mm., with diameters of 15 × 15 μ (outer). The striation is somewhat of the evanescent type and not that of *T. abyssicola.*

The above two lots are puzzling, but are too immature for a definite conclusion to be reached.

Subfamily GRYPHINAE Sahni, 1929

(nom. nov., to replace *Terebratulinae* Dall, 1870, which conflicts with the genus *Terebratulina*).

Genus *Gryphus* Megerle von Mühlfeldt.

1811. *Ges. nat. Fr. Berlin, Mag.* V., p. 64.

Gryphus capensis sp. nov.

(Pl. I, figs. 10-13.)

Description: Shell small, longitudinally oval, with somewhat straight sides and very slightly truncated front, widest at the middle and tapering posteriorly. Valves regularly convex, ventral deeper than dorsal; anterior commissure rectimarginate. Beak short, rounded and with no apparent ridges, incurved dorsalwards and truncated by a small, circular, marginate foramen, separated from the hinge-line by a symphytium: the foramen is also slightly labiate and has a short, but distinct, pedicle-collar.

Interior of ventral valve smooth and with fairly strong muscle-impressions in the umbonal region; teeth small, situated at the basal angles of the symphytium: dorsal valve with cardinalia consisting of thin, concave hinge-plates uniting the socket-ridges and crural bases; small accessory outer socket-ridges; no median hinge-plates; cardinal process small and transverse; crural processes some distance down the almost parallel descending branches of the loop; transverse band narrow and arched ventrally; thin, thread-like septum separating the distinct muscle impressions in the umbonal region.

Dimensions: A. 5626 (Paratype), length 9·9 mm., breadth 6·5 mm.
A. 5627 (Holotype), length 13·5 mm., breadth 9·7 mm.

Type-specimens: As above; both in the South African Museum.

Type-localities: Holotype: 29 miles SW. of Cape St. Francis, 75 fathoms.
Paratype: 73 miles S. by W. of Cape St. Blaize, 125 fathoms.

Remarks: In his Annotated List of the Recent Brachiopoda, the late Dr. W. H. Dall, in 1920,[16] showed that the familiar generic name *Liothyrina* Oehlert must give way to the earlier name of *Gryphus* of Megerle von Mühlfeldt, 1811, the type species of which is the *Anomia vitrea* Born, 1778, a common Mediterranean species.

The general characters of the new Cape species seem to place it in the *Gryphus* group rather than in that of *Liothyrella* Thomson. As pointed out in a previous paper,[23] the *Gryphus* (olim *Liothyrina*) group comprises fairly large shells with a somewhat truncated front, and, in some cases, broad dorsal uniplication, together with a loop with long, almost parallel, descending branches, with crural processes a little distance down, and a broad transverse band, as in *Gryphus vitreus*, *sphenoideus*, *cubensis*, *bartletti*, and *stearnsi*: the *Liothyrella* group, on the other hand, comprises broadly dorsally uniplicate oval shells, usually of small size, with a rounded front, and possessing a loop of a short triangular form, with crural processes close in, and a very narrow transverse band, as in *Liothyrella uva*, *notorcadensis*, *antarctica*, etc. The features in these two groups are correlated with certain types of spiculation in the animal (see Blochmann,[14a, 14b]).

Though *Gryphus capensis* is smaller than the other species assigned to the genus, its loop bears considerable resemblance to that of *G. stearnsi* or *G. sphenoideus*, as figured by Blochmann ([14b]pl. 39, figs. 29 and 23a); the transverse band is, however, much narrower.

A small *Gryphus*-like species was dredged by the 'Challenger' Expedition in 1873, off the Cape of Good Hope, at Station 142, lat. 35°4′S., long 18°37′E., at a depth of 150 fathoms. Davidson ([5]pp. 29-30, pl. II, figs. 5-6) referred the species to *Terebratula vitrea* var. *minor* Philippi (now *Liothyrella affinis* Calcara). The specimens are in the British Museum: they are not so elongate as *G. capensis*, being slightly broader. A similar species was dredged by the 'Valdivia' Expedition in 1898, from the Agulhas Bank, and was described, but not named, by Blochmann in 1906 ([14a]p. 699) and in 1908 ([14b]pp. 605, 613, and 630, pl. 39, fig. 31). He compared it with the 'Challenger' specimen and concluded that both were specifically distinct from *L. affinis* in the character of the loop and in other features. In 1906 he referred it to the *Gryphus* (= *Liothyrina*) series and ranged it with the larger species *G. vitreus*, etc.—a group without certain spicules penetrating the bases of the cirri. In his distributional map of 1908 ([14b]pl. 40), however, it is placed with the series containing *Liothyrella affinis*, *antartica*, etc.

Unfortunately the 'Valdivia' example has not been fully figured, the loop only having been illustrated by Blochmann ([14b]pl. 39, fig. 31). Without a further examination and a comparison of the 'Challenger' and 'Valdivia' examples with the present species it is not possible to be sure of their identity. The habitat of the two former is some distance to the west of that of *G. capensis*, but does not rule out the probability of the species being identical.

In connexion with the relationship of the South African brachiopod fauna, mention might be made here of other occurrences of species of either *Gryphus* or *Liothyrella* in localities not far removed from the South African region. Of some interest is the record of *Terebratula cernica* Crosse,[24] which was obtained from the stomach of a fish taken at a depth of 80 fathoms off the Island of Mauritius. It is a larger species than *G. capensis* but nothing is known of its

loop or interior features. It was refigured by Davidson in 1886 ([19]p. 16, pl. I, fig. 19) as *Liothyris cernica*, and was later referred tentatively to the *Gryphus vitreus* series by Blochmann ([14b]p. 625, pl. XL). According to the latter, Studer also mentions a fragment of a similar Terebratulid obtained at Mauritius by the 'Gazelle' Expedition, 1874-6. Further, a *Liothyrina* (= *Gryphus*) sp. indet. was recorded by Dall ([25]p. 439, pl. 26, figs. 1-2) from south of Saya de Malha Banks, NNE. of Mauritius. In outward form it approached *G. bartletti* (West Indies); its loop showed affinity with *G. sphenoideus* (West Mediterranean and East Atlantic, off Portugal, etc.); and the spiculae were closely allied to *G. vitreus* (Mediterranean and East Atlantic) ([17]p. 46).

Two examples of a further interesting species of *Gryphus* were dredged by the 'Challenger' Expedition in 1876, off Ascension Island, in 420 fathoms, and were regarded by Davidson ([5]p. 28, pl. II, figs. 10-11) as agreeing in every respect with the *G. cubensis* (Pourtales) from 100 to 300 fathoms off the Florida Reefs. Blochmann, in 1908 ([14b]pp. 622-3, pl. 38, fig. 20) refigured one of the 'Challenger' specimens, and remarked upon its somewhat asymmetric outline. More examples are required in order to establish the exact status of the Ascension Island form.

Family TEREBRATELLIDAE King, 1850.

Subfamily MEGATHYRINAE Dall, 1870.

Genus *Megathiris* d'Orbigny.

1847. *C.R. Ac. Sc., Paris*, xxv, p. 269.

Megathiris capensis sp. nov.

(Pl. II, figs. 3-6, 9-13, 16, 17.)

Description: Shell small, transversely ovate, with a long straight hinge-line, almost or quite equal to the full width of the shell; rounded anteriorly; strongly convex, the ventral valve being considerably deeper than the dorsal; surface smooth except for rather strong growth-lines; test thick and visibly punctate; cardinal area in each valve, that on the dorsal valve being small and visible only at the cardinal extremities. Ventral valve very deep, with truncated rostrum, large submesothyrid foramen, rudimentary deltidial plates separated by linear grooves from the adjacent area which is high and triangular; interior furnished with two short, lateral septa near the anterior border, and one long, thin, median septum extending backwards from just within the anterior border to the umbo where it is high-standing and supports a distinct pedicle-collar; hinge-teeth fairly large, widely separated, and without dental plates; internal surface covered with white, rounded, granulations like shagreen. Dorsal valve shallow with slightly protuberant apex, furnished with three prominent septa thickened and denticulated along their crests; the two lateral septa, which commence within the anterior border, possess bulbous triangular apices with points directed towards the lateral borders of the shell, they extend backwards as low ridges to about the middle of the valve: the median septum, which has a bulbous rounded apex, commences at the same distance from the anterior

border and extends backwards as a low ridge to the hinge platform: cardinalia consisting of two prominent socket ridges, widely separated but united across the umbonal cavity by two broad, excavate, hinge-plates resting on the posterior prolongation of the median septum; no true cardinal process, the diductor muscles being attached to a vertically striated apical portion of the interior of the valve; crura very short, crural processes large, convergent; loop as in *M. detruncata*: lophophore ptycholophous.

The shell shows no sign of folding, the anterior commissure being rectimarginate.

The lophophore is ptycholophous, as in *Megathiris detruncata* (Gmelin). (See plate II, fig. 17.)

Dimensions: Holotype, A. 5616a, 7·1 × 5 mm.
Paratype, A. 5616b, 7·5 × 5 mm.

Type-specimens: As above, both in South African Museum.

Type-locality: Dredged in 45 fathoms, with *Crania roseoradiata* sp. nov., 7 miles SSW. of Constable Hill (Saldanha Bay).

Remarks: The genus has not hitherto been recorded from South Africa, and its occurrence there is of extreme interest since it appears to be peculiarly northern as regards both recent and fossil occurrences. A Tertiary fossil form with some external resemblance to *Megathiris* has been recorded from Chile by Dr. A. Philippi ([44]p. 218, pl. 49, fig. 11). The species is described as *Terebratula depressa* and comes from Lebu, and the author suggests, from its extremely small size, that it is possibly not fully adult. 'It resembles', he says, 'the *T. detruncata* of European Seas very much, which belongs to the genus *Megathiris* d'Orbigny.'

D. P. Oehlert, in 1888 ([45]p. 814), referred *T. depressa* Phil., to *Megathiris*. Von Ihering, in 1903 ([46]p. 338), also placed it in the same genus along with *Argiope barretiana* Davidson which occurs in the West Indies and Florida (43–461 fathoms) and off Rio de Janeiro (70 fathoms). The latter is now regarded as *Argyrotheca barretiana*. Von Ihering ([46]p. 341) regarded the presence of a species of *Megathiris* in the Tertiary of Chile as confirming the Atlantic character of the Tertiary fauna of that country, the presence of this and other forms being explained easily by the free communication of seas in Central America, certainly in Eocene and probably in Miocene times.

Until other, and more adult, examples of the '*Terebratula*' *depressa* Philippi are forthcoming, there remains some doubt as to its generic relationship. It may be pointed out that Philippi's name is pre-occupied by the *Terebratula depressa* Faujas 1799, a Cretaceous (Senonian) species from France and Holland.[47] This was referred to *Megathiris* by d'Orbigny in 1847 ([48]p. 149) and to *Cistella* by de Morgan in 1883 ([49]p. 10 of reprint). *Cistella* is now *Argyrotheca* Dall.

The Cape species is very distinct from the genotype *Megathiris detruncata* (Gmelin) (pl. II, figs. 1, 2, 7, 8, 14, 15), which occurs in the Mediterranean and East Atlantic from Guernsey and the Scilly Is. to Madeira (16–100 fathoms),

and is recorded as a fossil from the Eocene, Miocene and Pliocene of south and eastern Europe.[50] *Megathiris capensis* is larger and more transverse, in addition to being entirely smooth externally and more rugose internally.

Jeffreys ([51]p. 124, pl. 5, figs. 3a-c) records a form of *M. detruncata* from Guernsey which has weaker costation: it resembles a horse's hoof in shape, being longitudinally oval, instead of transversely oblong (as in Mediterranean examples); the costae are much fainter and do not extend to the anterior margin. He also refers to specimens in the M'Andrew collection from Madeira, which, though smaller, have the same form and sculpture. These, he considers, may therefore belong to a distinct and undescribed species.

Sacco, in 1902 ([52]pp. 30-1), figured and briefly described several varieties of *M. detruncata* from the Italian Tertiary rocks. These include a var. *semilaevis* ([52]pl. 6, figs. 17-19) in which the costation does not reach the margin which is smooth: it occurs frequently in the Middle Miocene and Lower Pliocene, and suggests Jeffreys's form previously mentioned and an Italian Eocene species, referred to *M. detruncata* by Davidson ([53]pl. XXI, figs. 6-8). Another of Sacco's varieties is var. *perlaevis* ([52]pl. 6, fig. 20), in which the valves are smooth or nearly so: it occurs somewhat rarely in the Middle Miocene and Lower Pliocene. Sacco's figure of this variety is an external view of the dorsal valve: it strongly suggests the Cape species, but in the absence of an interior view of this fossil a comparison of the cardinalia, etc., with those of the present species cannot be made.

Subfamily KRAUSSININAE Dall, 1870.

The subfamily position of the genus *Kraussina* and some allied genera has been the subject of much difference of opinion in the past. Dall in 1870 ([9]p. 138) created the subfamily *Kraussininae* for *Kraussina rubra* and four other species including *lamarckiana* which later (in 1884) became the genotype of *Megerlina*. The same subfamily was adopted by Davidson in 1887 ([19]p. 118), and by Schuchert in March 1893 ([40]p. 160). But Beecher in 1893 ([29]p. 391) placed *Kraussina* and *Megerlina* in his new subfamily *Magellaniinae* along with *Magellania*, *Terebratella*, and others, and at the same time created a new subfamily *Dallininae* to embrace *Dallina*, *Macandrevia*, *Terebratalia*, *Laqueus*, *Mühlfeldtia*, etc. At that time the genus *Mühlfeldtia* included *truncata* and what is now known as *Frenulina sanguinolenta*. The latter species, under the name *M. sanguinea*, was used by Beecher in illustration of one of the stages in the ontogeny and morphology of the *Dallininae*, the stage being called the 'Mühlfeldtiform' stage. In studies made in 1916 ([30]p. 24) I found that *Mühlfeldtia truncata* differed fundamentally from *Frenulina sanguinolenta* and I transferred the former genus to the *Magellaniinae* and changed Beecher's stage name in the *Dallininae* from 'Mühlfeldtiform' to 'Frenuliniform'. This is now generally accepted. My reasons for the transfer were based upon the absence of dental plates in *Mühlfeldtia truncata*, as well as in the resemblance of the early loops stage to a similar stage of *Terebratella dorsata*, and the appearance of the

secondary loop before the appearance of the primary lamellae. It was pointed out for the first time in that paper that in the *Dallininae* the descending branches of the loop (i.e. the primary loop) were united to the septum at an earlier stage than in the *Magellaniinae*. In the same paper I also emphasized a hitherto unrecognized feature in the *Dallininae* of the universal presence (except in adults of the genus *Dallina*) of dental plates in the ventral valve.

Though possessing close affinities with the *Magellaniinae*, I was not fully satisfied in 1916 that *Mühlfeldtia* rightly belonged to that subfamily or to a new one altogether. The matter was taken up later in the same year by J. A. Thomson ([31]p. 498) and again in 1918 ([15]p. 7). In these valuable papers he foreshadowed a separate subfamily to include *Kraussina*, *Megerlina* and *Mühlfeldtia*, and in his later Manual ([28]p. 219) placed these three genera together with *Pantellaria* and *Aldingia* in the emended but almost forgotten subfamily *Mühlfeldtiinae* Oehlert 1887 ([39]p. 1314). It is unfortunate that Oehlert in proposing this subfamily was not more precise in specifying the genera he proposed to assign to it, but one can assume, from the arrangement of the genera on later pages ([39]pp. 1322-3), that it comprised *Mühlfeldtia* (*M. truncata*) [with Section *Megerlina* (*M. lamarckiana*) and *Ismenia* (*I. pectunculus*)], *Kraussina* (*K. rubra*), and *Platidia* (*P. anomioides*).

The close relationship of *Mühlfeldtia*, *Megerlina* and *Kraussina* as regards loop-development and spiculation was clearly demonstrated by Deslongchamps in 1884 ([32b]p. 122).

Davidson in 1887 ([19]p. 118), placed *Kraussina* and *Megerlina* in the subfamily *Kraussininae*, and Dall in 1920 ([16]pp. 374-6), followed the same procedure, at the same time placing *Mühlfeldtia* and *Pantellaria* in the subfamily *Mühlfeldtiinae*.

Though *Kraussina*, *Megerlina* and *Mühlfeldtia* are so closely related in loop characters, there are certain other minor points in which they differ. *Kraussina* does not possess a pedicle-collar in large adult shells: in these there is only a narrow thickened band fused to the floor of the umbonal cavity (as in *Coptothyris*, *Terebratalia*, and other higher long-looped forms). In very young shells about 4 mm. and 6 mm. in size the band is slightly free anteriorly, which suggests that in still earlier stages there may be a free pedicle-collar. *Megerlina* and *Mühlfeldtia* possess a free or true pedicle-collar up to the adult stage (see [30]p. 25). Pending further detailed study of the animals I feel disposed at present to place *Kraussina*, *Megerlina* and *Mühlfeldtia* in Dall's subfamily *Kraussininae* which antedates *Mühfeldtiinae* Oehlert by several years.

Genus *Kraussina* Davidson.

1859. *SB. Ak. Wien. Math.-naturw.*, pl. xxxvii, p. 189, 210 (pro *Kraussia* preocc.).

From a careful study of numerous specimens and of the literature upon the subject, the only species which I consider as coming within the genus *Kraussina*

proper are *K. rubra* (Pallas), *K. cognata* (Sowerby), *K. gardineri* Dall, and *K. crassicostata* sp. nov., described in a later page.

The area of distribution of this genus is of peculiar interest. So far as is known at present it ranges from the Cape of Good Hope to the Indian Ocean south of the Saya de Malha Banks. The species restricted to the Cape itself are three in number, viz. *K. rubra*, *cognata* and *crassicostata*. The Indian Ocean form is *K. gardineri*. It is seen from the above that the distribution of the genus is somewhat discontinuous, there being no record of its occurrence between Port Alfred and the Saya de Malha Banks, except a reference by Davidson, in 1887 ([19]p. 120), to some small specimens erroneously described by Gray in 1872 under the mistaken name of *Terebratula truncata* (= *Mühlfeldtia truncata*). They were found attached to Ascidia, and to the stems of large algae, off the coast of Natal. These specimens are referred to *Kraussina rubra* by Davidson. The occurrence of *K. rubra* here appears to me to be extremely doubtful in view of the direction taken by the Mozambique Current, viz. towards the Cape. Gray may have been correct in his attribution of the species to *Mühlfeldtia truncata*. In 1921 ([17]p. 49) I referred to the presence in the British Museum (Natural History) of an immature example of this typical Lusitanian species, labelled 'S. Africa. J. H. Ponsonby coll. 1900. 6.13.4'.

Unfortunately full details as to habitat and depth have not always been recorded, hence it is impossible at present to give the bathymetric range of *Kraussina*, but, from the available data and from the thick-shelled character of the Cape species, the genus appears to be one of fairly shallow water.

It is also to be regretted that in most of the literature dealing with *K. rubra* one finds no more precise locality than 'Cape of Good Hope'. More data on these points are badly needed.

The genotype of *Kraussina* is the *Anomia rubra* Pallas 1766. The original generic title proposed by Davidson in 1852 ([8b]p. 369) for the reception of this species was *Kraussia*, but this name having been used by Dana for Crustacea earlier in the same year, *Kraussina* was suggested by Suess in 1859 ([33]p. 210) in collaboration with Davidson, who confirmed it in 1861 ([34]p. 39).

Davidson, in 1887 ([19]p. 118), included seven species in the genus, five in *Kraussina* proper (viz. *rubra*, *cognata*, *deshayesi*, *pisum* and *atkinsoni*), and two in the subgenus *Megerlina* (viz. *lamarckiana* and *davidsoni*). Only two of these are strictly referable to *Kraussina*, viz. *rubra* and *cognata*. The generic position of the remaining five forms will be dealt with in the sequel.

Kraussina rubra (Pallas)
(Pl. III, figs. 1, 2.)

Anomia rubra Pallas, *Misc. Zool.*, 1766, p. 182, pl. XIV, figs. 2-11.

Terebratula capensis Kuster (not Adams and Reeve), 'Mart. and Chem.', *Conch. Cab.*, 1848, p. 32, pl. 3, figs. 15-17.

Terebratula capensis Krauss (not Adams and Reeve), *Südafr. Moll.*, 1848, p. 32, pl. II, fig. 10.

Terebratula (*Kraussia*) *rubra* Reeve, 'Mon. Terebratula', *Conch. Icon.*, 1861, pl. IX, fig. 37.

Kraussina rubra Davidson, 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. II, 1887, pp. 119-21, pl. XX, figs. 19-23.

Remarks: This well-known species has been met with at several localities around the Cape, but little is known as to its range in depth. It has been seen by the writer from Port Elizabeth, Algoa Bay and Port Alfred, and from the Agulhas Bank, 22 fathoms. A figure of a specimen from the last locality, agreeing closely with Pallas's original, is given here (pl. III, fig. 1) for comparison with the new species described in a later page.

Kraussina rubra has been described and figured by several authorities and appears to present a certain amount of variation in outward form. The *Anomia rubra*, as figured by Pallas, is a transversely oval and costate shell, without apparent fold or sinus; but many specimens of equal size which I have examined show a strong ventral fold and dorsal sulcus: these features are well marked from the umbonal region. In these the shells are ventrally uniplicate or sulcate. Some forms tend to become more elongate than others. There is also some slight variation in the intensity of the costae.

It is not my intention to burden this paper with a full revised description of *Kraussina rubra*, but some important details are necessary in order to emphasize certain differences between this genus and that of *Megerlina* dealt with in a later page.

In the interior of the dorsal valve of *K. rubra* the cardinalia consist of two divergent socket-ridges bounding the dental-sockets. Lying between these ridges is an umbonal callosity with two eye-like depressions on its surface. There are no excavate hinge-plates, even in shells as small as 4 mm. in size. At the apex a small cardinal process is present. A grooved median septum rises from the umbonal callosity and extends some distance down the interior of the valve. From its anterior extremity arise two short, deviating lamellae extending towards the ventral valve: these fork at their ends, giving rise to anterior and posterior processes. These processes are usually quite short, but in some specimens the posterior processes are in the form of long narrow ribbons extending backwards and slightly inwards towards each other: they possess hook-like extremities. The loop is essentially adult in shells 6 mm. long.

The dorsal valve also possesses a slight, but distinct, cardinal area, a feature of unusual occurrence, found also in the genera *Mühlfeldtia* and *Megerlina* (see [17]). There are a few spines within the margin.

In the ventral valve the features of importance are the absence of dental-plates and of a free pedicle-collar. As previously stated, in adult shells, there is a thickened band in place of the latter, but in very small specimens this band may be free anteriorly.

The dense character of the shells of this species renders it somewhat difficult to make a study of the punctation. I have, however, succeeded in one or two cases with interesting results. Adult shells have large oval pores on the

exterior, these pores being denser and larger in the grooves than in the costae. In specimens from Port Elizabeth I have counted as many as 256 pores per sq. mm. in the grooves, as against 168 pores in the costae. In the former they measure 60 × 30–35 μ , and in the latter, 45–50 × 15–20 μ. On the inner surface the dimensions are 15 × 15 μ for all pores. The young specimens, however, exhibit some interesting differences both as regards punctation and interior details. These are perhaps worth recording. In a specimen 6 mm. long, on which fine costation is visible, the punctae appear to be evenly distributed with no differentiation in the grooves or on the costae: they average 244 per sq. mm. at the middle of the ventral valve. Internally this valve has a narrow band within the apex which is slightly free anteriorly. The dorsal valve is like the adult, without excavate hinge-plates; and has a loop consisting of two very broad divergent lamellae, slightly bifurcated at their extremities. Widely-spaced spinules occur just within the margin of the valve. In a smaller specimen 4 mm. long, the punctae are moderately round with no differentiation, being 188 per sq. mm. Internally it is much the same as the other, but the extremities of the divergent lamellae are without bifurcations.

The spiculation of the mantle of *Kraussina rubra* was studied by Deslongchamps in 1864 ([42]p. 25, pl. II, figs. 10-12), and again in 1884 ([32b]pp. 121 et seq. and 160, pl. XIX, fig. 7). The spicules are of a very special form and very small. Two systems exist, one in the mantle, the other in the pallial sinuses. Spicules also exist in the walls of the visceral chamber and in the arms.

Kraussina cognata (Sowerby).

Terebratula cognata Sowerby, *Thes. Conch.*, vol. I, 1847, p. 346, pl. 68, figs. 12-14.
Terebratula cognata Küster, in 'Mart. and Chemn.', *Conch. Cab.*, Bd. VII, I, 1848, p. 46, pl. 4, figs. 5-6 (as figs. 3-4 in text).
Terebratula (*Kraussia*) *cognata* Reeve, 'Monogr. Tereb.', *Conch. Icon.*, 1861, pl. IX, figs. 38a, b.
Kraussina cognata Davidson, 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. II, 1887, pp. 121-2, pl. XX, figs. 24-6 (var.? 27-30).

Remarks: According to figures and descriptions this species is somewhat subtrapezoidal or elongated, with a nearly straight hinge-line almost as long as the width of the shell. The colour is pale yellow and the surface covered with radiating costae. Chemnitz, in 1785 ([2]p. 78, pl. 76, figs. 688a, b) described and figured a shell from the Cape as '*Cognata Anomiae craniolaris basi perforata*', but from his poor description and illustrations and from the fact of his not being a binomial writer, the *Terebratula cognata* of Sowerby is regarded as the type.

Davidson gives copies of the figures of Sowerby and Reeve which show the type of folding as sulcate.

Unlike *Kraussina rubra*, this species increases in length but retains the megathyrid type of cardinal margin.

This species requires more careful study and more material. I have only been able to examine one or two indifferent specimens which appear to agree with the description of the species. In these the cardinalia, etc., agree essentially with *K. rubra*, and the interior of the dorsal valve is very spinous just within the margin. Spicules are present in the ventral and dorsal mantles. Owing to the almost smooth condition of the surface of the valves, there is no differentiation in the punctation. The pores about the middle of the ventral valve are small, even, and widely-spaced, and number 160–176 per sq. mm. They are 15 × 15 μ in size, but a few reach 20 × 20 μ.

Habitat: South Africa, near the Cape of Good Hope.

Note. Dr. K. H. Barnard has recently submitted a large example of a *Kraussina* containing the dried animal dredged in 10–14 fathoms at Saldanha Bay by the *Pieter Faure*. Its registered number in the South African Museum is A. 5607. It is said to have been identified as *Kraussina cognata* by G. B. Sowerby and may be this species. The dimensions are: L. 32·2, W. 29·5, D. 18·3 mm. The earlier growth-lines suggest a shell wider than long, as in *Kraussina rubra*. The shell is hardly sulcate and of a pale yellow colour, and possesses moderately strong radiating costae.

The occurrence of the genus at Saldanha Bay is of extreme interest: it probably reached the South Atlantic coast by the aid of the Benguela Current.

Two other interesting brachiopods are recorded in this memoir from this neighbourhood, viz. *Crania roseoradiata* sp. nov. and *Megathiris capensis* sp. nov.

Kraussina gardineri Dall

Kraussina gardineri Dall, 'Brach. of the Sea Lark Exped.', *Trans. Linn. Soc. Lond.*, ser. 2, Zool. vol. 13, 1910, p. 440, pl. 26, figs. 3-6.

Description: Shell rude and solid, greyish white, similar in shape to *Mühlfeldtia truncata* when young with shell 12 × 13 mm. in size. During growth, the outline elongates proportionally more that it widens, and an adult measures 24·5 mm. in length by 23 mm. in width at the broadest part. Outline then roughly rhombic. Dorsal valve slightly sulcate; ventral valve with corresponding convexity. Latter valve slightly more convex than dorsal: total thickness of adult about half its length. Beak short and wide; peduncle short; foramen wide and incomplete, margins more or less eroded or defective; wide flattened area of irregular shape on each side of foramen.

Surface of valves with coarse, rounded costae, strongest mesially, with subequal roundly excavated interspaces: costae mostly continuous from beaks, and increasing rather by bifurcation than by intercalation: about forty costae in adult, the laterals being finer and closer-set than the others.

Interior of valves strongly calcified; spinules within margin.

Habitat: Station C1, Indian Ocean, south of the Saya de Malha Banks, in 123–153 fathoms (dredged by J. Stanley Gardiner, after whom it is named).

Remarks: Judging from Dall's figures, the cardinalia and brachidium of this species are essentially of the *Kraussina rubra* type, but there appears to be more excessive calcification in the umbonal cavity.

The occurrence of *Kraussina* in the Indian Ocean is of great interest. Associated with the species was a curious intraplicate Rhynchonellid (*Hemithyris sladeni* Dall) which is tentatively referred to the Early Tertiary New Zealand genus *Aetheia* by Thomson ([28]p. 157); and a *Liothyrina* sp. indet., having some affinities with Mediterranean forms (see also Jackson,[17] p. 46).

Kraussina crassicostata sp. nov.
(Pl. III, figs. 3-5.)

Description: Shell solid, subcircular, about as broad as long, with a broad, straight hinge-line somewhat shorter than the greatest width of the shell (= submegathyrid). Valves convex, the ventral much more so than the dorsal; sulcate (i.e. with a shallow sulcus in the dorsal valve opposed to a fold in the ventral valve); margins waved by alternate multicostation. Cardinal area in both valves. Surface covered with 10–12 coarse, angular, radial ridges, strongest mesially and becoming obsolete near the cardinal angles, separated by angular interspaces: ridges continuous from beak, broadening anteriorly, and increasing by bifurcation: they are crossed by fairly strong growth lines. Colour of surface reddish; punctate. Beak well-truncated, foramen very large (due to wear), and incomplete anteriorly,* slight deltidial plates, narrow sessile pedicle collar (i.e. thickened band) within the umbonal cavity. Interior of ventral valve fairly smooth, with distinct muscle impressions posteriorly; bluntly ridged round the margin (= reverse of external ornament); row of small spines just within the margin; teeth small, without dental plates, situated at anterior angles of inner margins of the two widely-separated portions of the transversely-grooved area. Interior of dorsal valve smooth, with well-defined muscle impressions, bluntly ridged margin, and row of spinules, as in ventral valve: cardinalia and brachidium essentially of the *Kraussina rubra* type: no hinge-plates proper, their place being occupied by two eye-shaped pits (for insertion of the pedicle-muscles) in a thick callus in the umbonal cavity between the distant and thick socket-ridges. Cardinal process small and prominent, united laterally to the posterior bases of the socket-ridges by narrow, vertically striated, muscular impressions, within the posterior margin of the umbonal cavity; rudimentary outer socket-ridges bounding the widely separated portions of the area of this valve. Mesial septum distinct, extending from the umbonal callus (where it appears to be grooved on its upper surface) to about the centre of the valve, where it supports two, short and narrow, divergent and ventrally directed lamellae.†

Dimensions: A. 5615 (Holotype), length 16·2 mm., breadth 16·2 mm., thickness 11·3 mm.

* Owing to wear it is not possible to define the type of foramen.

† In the holotype the extremities are broken, but in another example the extremities are flattened and forked (as in *K. rubra*).

Type-specimens: Holotype and two metatypes, No. A. 5615, in the South African Museum, Cape Town.

Type-locality: False Bay, 23 fathoms.

Remarks: This species differs from the genotype, *Kraussina rubra*, in possessing much coarser and less numerous costae which tend to become obsolete near the cardinal angles; the ventral valve is also deeper. *Kraussina cognata* (Sow.) is a longer species with a flattened dorsal valve, and of a pale yellow colour: *Kraussina gardineri* Dall is greyish in colour and possesses a more calcified cardinalia, etc.

The external surface of the ventral valve has large ovate punctae in the grooves with diameters of 45 × 30 μ, and about 256 per sq. mm., while the costae have smaller ovate punctae of less density: internally the punctae are very small and round, about 10 × 10 μ.

Spicules are present in fragments of the ventral mantle adhering to the interior of the shell, especially in the sinuses.

In some specimens in the Manchester Museum of apparently the same species and dredged with *Allopora nobilis* Kent near the Cape of Good Hope, in 26 fathoms, the punctae are similarly diversified, but are somewhat larger and rather less in relative density than in A. 5615.

Genus *Megerlina* Deslongchamps.

1859. *Etud. crit. Brachiop.*, p. 159.

1884. *Bull. Soc. Linn. Normand.*, viii, pp. 210, 243.

Having dealt with the species appertaining to the genus *Kraussina* proper, attention may be directed to other forms which in the past have been erroneously referred to that genus. Three related South African species are included in this group which may be termed the '*Terebratula pisum* series'.

Davidson, in his description of the 'Challenger' Brachiopoda ([5]p. 54), committed a most remarkable error in attributing to the *Terebratula pisum* Lamarck an altogether different species. I have examined the Cape specimens figured and described by Davidson as *Kraussina pisum* (Lam.), in the 'Challenger' Report ([5]pl. IV, figs. 7, 7a, 7b and 8) and later in his 'Monograph of Recent Brachiopoda' ([19]p. 123, pl. XXI, figs. 1-4). The figure 7a of pl. IV of the former report is reversed in printing from the stone (as are some others in the same work): that in the latter report (pl. XXI, fig. 2) is not reversed. The latter, and adjacent figures, however, are not so correct in detail as those in the earlier work, as they do not show the strong ventral plication of the species in question. Davidson's specimens are preserved in the British Museum: figs. 7, 7a and 7b, are the same shell drawn in different views and repeated in 'Recent Brachiopoda', pl. XXI, fig. 2; this shell is in the Zoological Department of the above Institution and is registered No. 78.6.15.27. Figures 1, 1a, 1b, 3 and 3a of pl. XXI are drawn from other specimens now preserved in the Geological Department of the same Institution (Reg. No. B. 12405). Figure 8 (interior

view) of pl. IV ('Challenger' Report) is repeated as fig. 4 of pl. XXI, in the Monograph.

The above species is certainly not the *Terebratula pisum* of Lamarck, 1819, as, according to the original description ([4]pp. 245-6), this is a small, smooth, subglobose red shell, resembling a cherry stone, and 9 mm. wide. The habitat given is 'Isle de France' (= Mauritius). Davidson's '*Kraussina pisum*' bears costae, somewhat like *Megerlina lamarckiana* (Dav.), but finer, and presents no resemblance to a cherry stone. It is also of a uniform light yellow colour, with no red markings at all. This species does not possess the *Kraussina*-type of cardinalia and brachial support, but shows a greater resemblance to *Megerlina* in these features. What I regard as the true *Terebratula pisum* Lamk. possesses essentially the same type of cardinalia and brachial support and must be placed in the same genus. A new specific name, therefore, is required for Davidson's shell. One other species, viz. *T. capensis* Ad. and Rve. = *deshayesi* Dav., also comes into the same genus, viz. *Megerlina.*

Megerlina striata sp. nov.
(Pl. III, figs. 6, 9.)

Kraussina pisum (non Lamk.) Davidson, *Voy. Challenger*, Zool. vol. I, 1880, p. 54, pl. IV, figs. 7-8. 'Mon. Rec. Brach.', *Trans Linn. Soc.*, ser. 2, vol. IV, Zool. pt. II, 1887, p. 123, pl. XXI, figs. 1-4.

Description: Shell small, transversely oval (except in young); colour yellowish-white. Dorsal valve slightly convex, with a distinct central longitudinal depression extending from a prominent umbonal swelling to the anterior margin and increasing in width rather rapidly. Hinge line nearly straight, about two-thirds the width of the valve. Ventral valve deeper than dorsal, longitudinally keeled. Folding sulcate. Beak slightly incurved, with a rather large incomplete foramen, bounded laterally by two small deltidial plates which curve upwards towards the dorsal umbo but fail to meet; beak-ridges very distinct, leaving a small flattened cardinal area between them and the deltidial plates. Foramen submesothyrid. Surface of valves covered with numerous distinct radii which increase by bifurcation and interpolation: cardinal angles smooth (i.e. radii absent on these portions); concentric growth-lines present at variable intervals. Interior of ventral valve with traces of radii like the exterior but reversed; spinous within margin. Pedicle-collar sessile, closely appressed to apex of umbonal cavity but slightly free in front especially near bases of teeth. The latter are comparatively small and not supported by dental plates. Interior of dorsal valve covered with rows of pustules radiating from apex; spinous within margin. Rudimentary area present in this valve.

The cardinalia (as seen in immature shell) consist of two rather stout divergent socket-ridges, excavate below, and supported on inner sides anteriorly by two spurs which extend to the median septum and enclose two eye-shaped muscular pits. Cardinal process feeble. Median septum extending from near

apex to centre of valve where it gives off two broad, thin diverging lamellae, the upper extremities of which are slightly forked, the posterior forks curving inwards to some extent. Midway down each lamella, on the exterior or dorsal face, an accessory process, or ledge, is present, analogous to that in *Megerlina lamarckiana*, but less developed.

Shell with large subcircular punctae.

Dimensions:	*Length*	*Breadth*	*Thickness*
Holotype 1. (pl. III, fig. 6)	14·1	16·2	5·9 mm.
Paratype 2.	13·5	14·9	5·1 ,,
,, 3. (interior details)	9·3	8·5	3·7 ,,

Note. No. 1 = pl. IV, fig. 7 of 'Challenger' Report, and pl. XXI, fig. 2 of Recent Brachiopoda.

Habitat: Station 142, lat. 35°4′S., long. 18°37′E., off Cape of Good Hope, 150 fathoms ('Challenger' Expedition). Type in the British Museum (Nat. Hist.) Registered No. 78.6.15.27.

Remarks: The above description is based upon three examples in the Zoological Department of the British Museum, the largest of which was figured by Davidson, as stated above. Owing to the risk of damage in opening the two large examples, the details of the cardinalia and brachidium are taken from the smallest specimen (N. 3), but these have been checked to some extent by No. 2 which was partly opened. There is reason to believe that No. 1 would exhibit a slightly more adult condition of the loop, etc.

Two other examples of this species were also figured by Davidson ([19]pl. 21, figs. 1 and 3) and are now in the Geological Department of the above Institution. These have also been examined externally and found to agree with those above.

The shells of this species have much larger punctae than those of *M. pisum* and *M. capensis*. The pores are subcircular in outline and range from 208 to 240 per sq. mm. about the middle of the ventral valve. The size of the pores in No. 1 is 45–50 × 45–50 μ (outer surface) (pl. III, fig. 9). They appear to be evenly distributed over the radii and grooves.

The South African Museum possesses the following specimens which seem to belong here:

A. 6410. 1 specimen (broken), dredged in 40 fathoms, St. Sebastian Bay, Agulhas Bank (K. H. Barnard, 1922).

A. 5663. 5 specimens dredged off East London in 32 fathoms, by the *Pieter Faure*.

A. 7690. 2 specimens (locality and depth unknown). *Pieter Faure* coll.

A. 5605. 1 specimen (broken) dredged off Cape St. Blaize (depth unknown). *Pieter Faure* coll.

The shells are mainly transversely oval, sulcate, and of a light yellowish colour, except one shell of A. 7690 which is white, and possess rather strong radii. In A. 5605 the radii are evanescent.

The four larger shells of A. 5663 measure: 10 × 10·7, 9·9 × 10, 10 × 9·3 and 8·5 × 8·7 mm.

Megerlina pisum (Lamarck)
(Pl. III, figs. 7, 10.)

Terebratula pisum Lamarck, *Animaux sans Vert.*, vol. VI, 1819, p. 245. (Text written by Valenciennes owing to Lamarck's blindness.)

Terebratula natalensis Krauss in Küster, *Conch. Cab.*, von Mart. u. Chem., Bd. VII, I, 1844 and 1848, p. 36, pl. 2b, figs. 4-7. (Plate published, 1844, text, 1848.)

Terebratula pisum Lamk. Sowerby, *Thes. Conch.*, I, 1846, p. 345, pl. 69, figs. 37-9.

Terebratula algoensis Sowerby, *Thes. Conch.*, I, 1847, p. 362, pl. 71, figs. 91-2.

Terebratula natalensis Krauss, *Südafrikanischen Mollusken*, 1848, p. 33, pl. 2, figs. 11a-c.

?*Terebratula* (*Kraussia*) *pisum* Lamk. Reeve, *Conch. Icon.*, vol. XIII, 1861, pl. 9, fig. 36a (non 36b).

Kraussina atkinsoni (non T. Woods), E. A. Smith, *Journ. Conch.*, vol. X, 1901, p. 116.

Description: Lamarck's description ([4]pp. 245-6) is as follows:
'Térébratule pois. Terebratula pisum.
T. testa minuta, subglobosa, laevi, subantiquata, rubella margine integro antice valde sinuato.
Habite à l'Ile-de-France. Par. M. Mathieu. Mus. no. Petite coquille semblable à un noyau de cerise, ne le surpassant pas en grosseur. Elle a 9 millimètres de largeur.

The following is an amplified description, based upon South African examples.

Shell small, transversely oval, with a subterebratulid type of cardinal margin; valves about equal in depth; dorsal valve sulcate, ventral broadly carinate; type of folding sulcate. Surface nearly smooth, with faint traces of costation; test finely punctate. Colour milk-white or slightly suffused with red. Beak suberect; foramen large, submesothyrid, incomplete; deltidial plates discrete, small, trigonal. Pedicle-collar sessile, slightly free in front. Hinge-teeth without dental plates. In the dorsal valve the cardinalia consist of two prominent, divergent, socket-ridges curling over the dental sockets posteriorly, and supported at their anterior corners by rudimentary excavate hinge-plates in the form of two spurs extending inwards towards the centre line of the valve: these enclose an imperfect hinge-trough; cardinal process small. The brachidium rises from the floor of the valve near the middle as two ventrally directed deviating lamellae which bifurcate slightly at their extremities: outer sides of the lamellae with two short accessory processes, representing the anterior portions of the descending branches: the lamellae extend backwards as low convergent plates forming a pseudo-septum as far as the imperfect hinge-trough.

Dimensions:	*Length*	*Breadth*	*Thickness*
Figured specimen (pl. III, fig. 7)	10·3	11·9	5·6 mm.
Others. South Africa	10·7	10·5	5·4 ,,
Umkomaas	9·4	10·2	4·1 ,,
,,	9·3	10·1	4·4 ,,
,,	8·6	9·3	4·3 ,,

Habitat: Umkomaas, Natal; Port Elizabeth, Algoa Bay; Durban, Natal; East London, etc.

Remarks: Though originally described from Mauritius, there are several specimens from such places as Port Elizabeth, Durban, etc., both in the British Museum (Nat. Hist.) and in private hands, which conform closely with Lamarck's description. As Lamarck's type was never figured, it seems desirable that illustrations should be given here of the South African specimens upon which my conclusions as to identity are based. Among the specimens preserved in the Zoological Department of the British Museum are seven from Umkomaas, Natal (J. H. Ponsonby coll. 1901.9.23.61-7), unfortunately without precise details as to depth, etc. Two other and larger specimens together with several juveniles are also in the same Institution, and are labelled simply 'S. Africa. J. H. Ponsonby. 99.4.14.3765-3771'. These two sets, as well as numerous others in private collections, including specimens in my own collection from Durban, Natal, and Port Elizabeth, Algoa Bay (both ex. H. McClelland, 1922), have been used in the study of the species. A specimen from the British Museum set marked 'S. Africa' has been selected to illustrate the exterior features (pl. III, fig. 7) and both this and others have been used for the interior details.

The punctae in the test of this species differ from those of *M. striata* in being more oval and on the whole less numerous (pl. III, fig. 10). Judging from the examination of about 15 specimens the number ranges 120–220 per sq. mm. at the middle of the ventral valve. The most prevalent numbers, however, are 160–190. The dimensions of the punctae are a little variable according to the presence or absence of strong growth-lines: they average 40–45 × 25–30 μ on outer surface, and 15–20 × 15–20 μ on inner surface.

Large spicules occur in the pallial sinuses, but are scanty in the cirri.

Victor Sganzin ([43]p. 12) in his reference to the *Terebratula pisum* Lamk. says it is very small and extremely rare: it is found at a great depth in Tombeau Bay, Mauritius, and dredging is necessary in order to obtain it.

The *Terebratula natalensis* of Krauss ([6]p. 33, pl. 2, figs. 11a-c) appear to belong to the species under review. His figure (fig. 11b) of the hinge-processes and brachial-support is remarkably accurate except that he appears to have overlooked the accessory ledges on the outer sides of the deviating lamellae. In his description he speaks of the shells being generally white in colour, more rarely flushed with red, and notes the sulcate character as well as the finely striated or almost entirely smooth condition of the surface of the valves. He records the species as living in great numbers at Natal Point (= Durban) in a depth of some fathoms, on stones, *Cardita variegata*, *Arca kraussi*, etc.

With regard to the species described and figured by Küster ([35]p. 36, pl. 2b, figs. 4-7) as the *T. natalensis* of Krauss, there is a little uncertainty as to absolute identity. His figures seem to suggest that he may have had before him an example of the *Terebratula capensis* Ad. and Rve. (= *Kraussina deshayesi* Dav.). The costation shown in the figures is stronger than in *M. pisum* (Lamk.).

Sowerby ([36]pp. 345-6), in his remarks on the species, says, 'also found at Sydney by Mr. Jukes'. This is undoubtedly an error: the Sydney citation probably refers to the *Megerlina lamarckiana* (Dav.), which was unknown at that time.

The *Terebratula algoensis* G. B. Sow., was described and figured in 1847 ([37]p. 362, pl. 71, figs. 91-2) from a single bleached ventral valve in the British Museum (N. H.), Zoological Department, labelled 'Algoa Bay; J. S. Bowerbank'. I have examined the specimen, which bears a registration number (rather indistinct), viz. 42.12.19.26, on the interior of the valve, and consider it to be a somewhat irregularly-grown valve of *M. pisum* (Lamk.). The number of punctae per sq. mm. is about 160, and the dimensions are; outer, 45–50 × 25–30 μ; inner, 15–20 × 15–50 μ.

In the *Journal of Conchology* for 1901, E. A. Smith ([13]p. 116) records *Kraussina atkinsoni* (T. Woods)—a Tasmanian species—for Algoa Bay, Cape Colony (Brit. Mus., J. H. Ponsonby). I have examined the specimens in question—four in mumber B.M. 1900.6.13.5-8)—and find them to be undoubted juveniles of *M. pisum* (Lamk.). The number of punctae per sq. mm. ranges from 160 to 182, and the size of the pores on the outer surface is 30–40 × 25–30 μ. In the '*Kraussina*' *atkinsoni* (T. Woods), judging from three specimens in my own collection from Long Bay, S. Tasmania (the type locality), the pore-density per sq. mm. is much greater, being 255–264; and the pores are practically circular and measure: outer, 30–35 × 30–35 μ; inner, 25–30 × 25–30 μ. They are distinctly visible under a lens. I do not consider *atkinsoni* a true *Kraussina* as it differs in shell-characters, and in its cardinalia and brachidium. Davidson's figures ([19]pl. 21, figs. 5-6) are, unfortunately, not quite accurate. The shells in my possession show the sulcate type of folding and two of them have rather indistinct costae on their outer surface. The species seems to be passing from a costate to a smooth stage. The ventral valve has a submesothyrid beak, a fairly large foramen, incomplete, and bordered anteriorly by small triangular deltidial plates; no dental plates; pedicle-collar deep, sessile, vertically striated, and slightly free anteriorly. In the dorsal valve the cardinalia consists of two upstanding socket-ridges on the inner sides of which are slight plates or buttresses which descend to the floor of the valve without meeting in the median line. These descending buttresses extend forward and converge about half-way down the valve, leaving a triangular trough below the apex in which is seen the two scars of the dorsal pedicle muscles. There is little or no cardinal process. Under each of the dental-socket brackets a slight cavity is present. About the centre of the valve arises the rudimentary brachidium in the form of two lamellae directed outwards and ventrally. The

conjunct bases of these lamellae extend backwards to a point which is embraced by the ends of the converging buttresses of the cardinalia, and the whole process presents the appearance of a bifurcated septum. The upper extremities of the lamellae are slightly forked, but bear no accessory processes on their external faces. With the exception of the latter, the whole structure is essentially that of *Megerlina lamarckiana*, or at least an early stage thereof, but whether *atkinsoni* should be placed in *Megerlina* or not is doubtful until more specimens are examined. It should certainly be removed from *Kraussina*.

I have recently received from Dr. Barnard a very small, smooth, white, sulcate shell, showing rather strong growth-halts. The foramen is incomplete: the deltidial-plates imperfect.

The specimen was dredged off Cape Natal (Durban) in 62 fathoms by the *Pieter Faure*, and was identified by G. B. Sowerby as *Kraussina atkinsoni*. Its museum registered number is A. 5604.

For the present, I am inclined to regard it as a juvenile *Megerlina pisum*.

Note. The interior details of the *Terebratula pisum* Lamk. for Mauritius are unknown and I have based my conclusions as to the identity of the South African specimens on outward appearance only. If further examples are obtained at Mauritius showing differences in cardinalia and brachidium the South African species should be known as *Megerlina natalensis* Krauss.

Megerlina capensis (Adams and Reeve)
(Pl. III, fig. 8).

?*Terebratula natalensis* Krauss in Küster, *Conch. Cab.*, von Mart. and Chem., Bd. VII, I, 1844 and 1848, p. 36, pl. 2b, figs. 4-7. (Plate published 1844; text 1848.)

Terebratula capensis Adams and Reeve (non Gmelin), *Voyage of H.M.S. 'Samarang'*, 1850, p. 71, pl. 21, fig. 4 (in colour).

Kraussia deshayesii Davidson, *Proc. Zool. Soc.*, 1852, p. 80, pl. 14, figs. 20-1 (in colour).

Terebratula (*Kraussia*) *deshayesii* Dav. L. Reeve, *Conch Icon.*, vol. XIII, 1861, pl. 9, figs. 35a, b.

?*Terebratula* (*Kraussia*) *pisum* Lamk. L. Reeve, *Conch. Icon.*, vol. XIII, 1861, pl. 9, fig. 36b (non 36a).

Kraussina deshayesii Davidson, 'Mon. Rec. Brach.', *Trans. Linn. Soc.*, ser. 2, vol. IV, Zool. pt. II, 1887, p. 122, pl. 20, figs. 31, 31a and 31b (= same figures as in 1852, but in black: fig. 31a = fig. 20; fig. 31b = fig. 21).

Description: Shell small, subovate, valves almost equal in depth; dorsal valve sulcate, ventral broadly cardinate, type of folding sulcate. Surface of both valves costate, some bifurcated and intercolated costae; concentric growth-lines moderate: test finely punctate. Colour yellowish, suffused with crimson. Beak suberect: foramen large, submesothyrid, incomplete; deltidial plates discrete, small, trigonal. In ventral valve, pedicle-collar sessile, slightly free in front; hinge-teeth without dental plates; interior sparsely tuberculate, with

a fringe of stronger tubercles just within the margin. In the dorsal valve the cardinalia and brachidium are essentially the same as in *M. striata* and *pisum*, but the accessory processes on outer sides of divergent lamellae are represented by slight curved ridges; interior of valve with rows of pustules radiating from the beak, increasing in size progressively, and ending in strong spines just within the margin.

Dimensions:		*Length*	*Breadth*	*Thickness*
Figured specimen (Pl. III, fig. 8).	(1)	7·4	6·7	3·1 mm.
Others	(2)	8·3	7·6	3·4 ,,
	(3)	8·5	8·2	3·8 ,,

Habitat: Cape of Good Hope, 120 fathoms.

Remarks: I have seen four specimens of this species from the Cape, all of which are in the British Museum (three in the Zoological Department and one in the Geological Department). One of these specimens (No. 1) is now refigured (pl. III, fig. 8). It was originally figured by Reeve ([38]pl. IX, fig. 35b) and is part of the Lombe Taylor collection in the above Institution, registered as 74.12.11.386. Reeve also figured another specimen (No. 2 above) from the Cuming collection in the British Museum ([38]pl. IX, fig. 35a).

The species was first described as *Terebratula capensis* in 1850 by Adams and Reeve ([7]pl. XXI, fig. 4) from a specimen dredged by the 'Samarang' in 120 fathoms at the Cape of Good Hope. The figure (presumably natural size) shows a shell 13·3 × 14·2 mm. in size. I have not been able to trace the original example. Davidson, in 1852 ([8a]pl. XIV, figs. 20-1) figured and described the species as *Kraussia deshayesii* as there was already a *K. capensis* (Gmelin) (a synonym of *K. rubra* Pallas). He gave the locality as 'Korea. Coll. Cuming'. The figure is repeated by Davidson in 'Recent Brachiopoda' ([19]pl. XX, figs. 31, 31a, 31b, in black), with the habitat corrected as follows: 'Dredged by Sir Edward Belcher off the Cape of Good Hope, in a depth of 120 fathoms.' This specimen is in the Davidson Collection, Geological Department, British Museum (N.H.) registered as B. 12402, and measures, according to the figure (fig. 31) 10·6 × 9·5 mm.

The shells of this species have rather large ovate pores, evenly spread over the costae and grooves, and ranging from 224 to 280 per sq. mm. about the middle of the ventral valve. The size of the pores (externally) is 40–50 × 30–50 μ.

The South African Museum has one perfect shell and a dorsal valve which I attribute to this species. The specimens were dredged with *M. striata* off East London in 32 fathoms by the *Pieter Faure* and are registered as A. 5663.

The perfect shell is longitudinally oval and measures: 8·3 × 7·6 mm. It agrees closely with Davidson's specimen ([19]pl. 20, fig. 31) in the geological department of the British Museum (Nat. Hist.) and that of pl. III, fig. 8 of this memoir. It is suffused with red. The interior of the odd dorsal valve is papillose: the brachium is broken.